

Abstract

The teachings of the subject invention lead to a new application of the XRR and RXRR systems. In particular, it has been recognized for the first time that such systems can be used to measure thickness of a variety of thin films (both dielectric, opaque and metal films) on patterned wafers where the feature size is smaller than the measurement spot. Broadly speaking, one aspect of the invention is the recognition that XRR and RXRR systems can be used not only on test wafers but on patterned wafers as well. The approach of the present invention to measuring the film thicknesses of patterned semiconductor wafers using XRR relies on the recognition that the measured X-ray reflection curve can be attributed primarily to the thicknesses of the layers rather than the structure of the pattern. In one aspect of the present invention, analysis of the patterned wafer may be reduced to the problem of analyzing an unpatterned wafer through a relatively simple transformation of the data. In another aspect of the present invention, analysis of the patterned wafer may be simplified by using a Fourier transform analysis.

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